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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/695,643

10/29/2003

Tomohiro Takamatsu

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EXAMINER

ERDEM, FAZLI

ART UNIT

PAPER NUMBER

2826

MAIL DATE

DELIVERY MODE

11/02/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No. 10/695,643	Applicant(s) TAKAMATSU ET AL.	
	Examiner Fazli Erdem	Art Unit 2826	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 July 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-10 and 12-32 is/are pending in the application.
- 4a) Of the above claim(s) 17-32 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9, 10 and 12-16 is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                      |                                                                   |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____                                                          | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments filed 4/6/2007 have been fully considered but they are not persuasive. Vente et al. prior art submitted by the applicant, shows Iridium in one of A or B sites for example in Table 1 on page 363. Furthermore, on page 361 on the abstract section, corner-sharing and face sharing sites, i.e. structural stability of Iridium added perovskites has been shown. Therefore, in examiner's opinion, one would have been motivated to used the structurally superior perovskite structure of Vente et al. in Suenaga et al, in order to have a stable perovskite structure. With respect to arguments on claim 8, Suenaga et al. disclose the required electrode structure. The usage of the disclosed electrode structure as a lower or upper electrode depends on type of application.

### *Allowable Subject Matter*

2. Claims 9, 10, 12-16 allowed.
3. The following is an examiner's statement of reasons for allowance: Prior art failed to establish prevoskite structure as required with the surface roughness of adhesive layer 0.79 nm or less.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

4.

*Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-8 rejected under 35 U.S.C. 103(a) as being unpatentable over Suenaga et al. (6,239,457) in view of Vente et al. (Journal of Solid State Chemistry, Prior art submitted by the applicant on 12/7/2006)

Regarding Claim 1, in Figs. 1A, 6, 7A, 7B, 8A-8D and 10, Suenaga et al. disclose a semiconductor memory device comprising: an insulating film 102 in Fig 10, formed over a semiconductor substrate 98; an adhesive layer 81 formed on the insulating film and having a surface roughness of 0.79 nm or less (as disclosed in Figs. 7A and 7B); a capacitor lower electrode 11 formed on the adhesive layer, a ferroelectric layer 104 formed on the capacitor lower electrode, and having an ABO<sub>3</sub> perovskite structure (A=any one of Bi, Pb, Ba, Sr, Ca, Na, K, and a rare earth element, B=any one of Ti, Zr, Nb, Ta, W, Mn, Fe, Co, and Cr) as disclosed in column 2, lines 34-55 and an upper capacitor electrode 105 formed on the ferroelectric layer. Suenaga et al. fail to disclose the required iridium in the ferroelectric layer. However, Vente et al. disclose a structure chemistry and electronic properties of the hexagonal perovskites BaIrCoO<sub>3</sub> which includes Ba in A site, Co in B site and Ir in at least one of A or B site as shown in pages 361-363.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required Ir in A or B sites of ABO<sub>3</sub> structure of Suenaga et al. in order to have a increased stability and diffusion characteristics between the lower electrode and the ferroelectric layer of Suenaga et al. since Suenaga et al. discloses that the lower electrode contains Iridium and the integration of Ir in the A site or the B site of ferroelectric layer enhances the diffusion barrier of the ferroelectric layer.

Regarding Claim 2, it is disclosed in Suenaga et al. that ferroelectric layer has preferred the orientation is perpendicular to substrate plane hence 0 degrees inclination from perpendicular direction which would satisfy 3.5 degrees or LESS claim language), a ferroelectric layer 104 formed on the capacitor lower electrode, and having an ABO<sub>3</sub> perovskite structure (A=any one of Bi, Pb, Ba, Sr, Ca, Na, K, and a rare earth element, B=any one of Ti, Zr, Nb, Ta, W, Mn, Fe, Co, and Cr) as disclosed in column 2, lines 34-55

Regarding Claim 3, Regarding Claim 13, Fig 3 of Suenaga et al. disclose PZT based ferroelectric layer 104.

Regarding Claim 4, it is disclosed in Suenaga et al. that ferroelectric layer has preferred the orientation is perpendicular to substrate plane hence 0 degrees inclination from perpendicular direction which would satisfy 2.3 degrees or LESS claim language), a ferroelectric layer 104 formed on the capacitor lower electrode, and having an ABO<sub>3</sub> perovskite structure (A=any one of Bi, Pb, Ba, Sr, Ca, Na, K, and a rare earth element, B=any one of Ti, Zr, Nb, Ta, W, Mn, Fe, Co, and Cr) as disclosed in column 2, lines 34-55

Regarding Claim 5, in Suenaga et al., lower electrode 11 is Pt or Ir as disclosed column 2 lines 22-33

Regarding Claim 6, Figs. 7A and 7B of Suenaga et al. disclose an adhesive layer having a surface roughness of 0.79 nm or less.

Regarding Claim 8, upper electrode of Suenaga et al. is Pt or Ir as disclosed column 2 lines 22-33

3. Claim 7, rejected under 35 U.S.C. 103(a) as being unpatentable over Suenaga et al. (6,239,457) in view of Vente et al. (Journal of Solid State Chemistry, Prior art submitted by the applicant on 12/7/2006) further in view of Nam et al. (2003/0057464).

Regarding Claim 7, in Figs. 1A, 6, 7A, 7B, 8A-8D and 10, Suenaga et al. disclose a semiconductor memory device comprising: an insulating film 102 in Fig 10, formed over a semiconductor substrate 98; an adhesive layer 81 formed on the insulating film and having a surface roughness of 0.79 nm or less (as disclosed in Figs. 7A and 7B); a capacitor lower electrode 11 formed on the adhesive layer, a ferroelectric layer 104 formed on the capacitor lower electrode, and having an ABO<sub>3</sub> perovskite structure (A=any one of Bi, Pb, Ba, Sr, Ca, Na, K, and a rare earth element, B=any one of Ti, Zr, Nb, Ta, W, Mn, Fe, Co, and Cr) as disclosed in column 2, lines 34-55 and an upper capacitor electrode 105 formed on the ferroelectric layer. Vente et al. disclose a structure chemistry and electronic properties of the hexagonal perovskites BaIrCoO<sub>3</sub> which includes Ba in A site, Co in B site and Ir in at least one of A or B site as shown in pages 361-363. Suenaga et al. and Vente et al. combination fail to disclose the required Al<sub>2</sub>O<sub>3</sub>/alumina adhesive layer. However, Nam disclosed a ferroelectric memory device and method of fabricating the same where in paragraph 035, the required Al<sub>2</sub>O<sub>3</sub> adhesive layer is disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to include the required alumina adhesive layer in Suenaga et al. and Verde et al. combination as taught by Nam, in order to have a ferroelectric memory device with better adhesion properties.

*Conclusion*

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fazli Erdem whose telephone number is (571) 272-1914. The examiner can normally be reached on M - F 8:00 - 5:00.


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on (571) 272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

FE  
October 22, 2007

  
SUE A. PURVIS  
SUPERVISORY PATENT EXAMINER